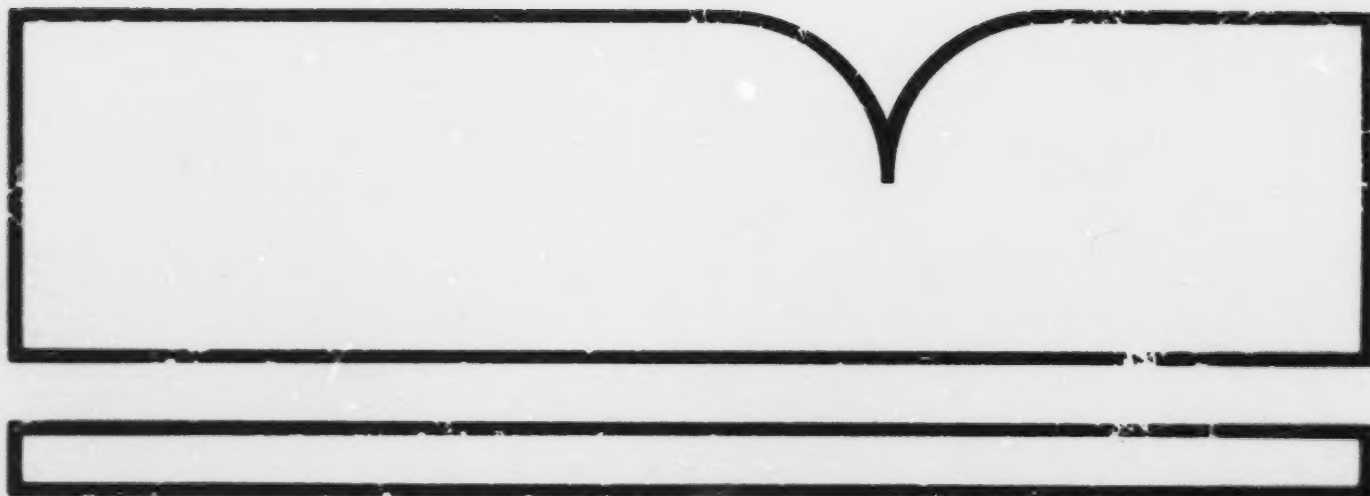


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Proposed Best Demonstrated Available Technology
(BDAT) Background Document for K021. Volume 5

(U.S.) Environmental Protection Agency, Washington, DC

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This background document provides the Agency's technical support and rationale for selecting and developing the proposed treatment standards for the constituents to be regulated in K021 waste. This document explains how EPA determines BDAT, selects constituents for regulation, and calculates treatment standards.

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**PROPOSED BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT)
BACKGROUND DOCUMENT FOR K021**

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November 1989

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1. INTRODUCTION

Pursuant to section 3004(m) of the Resource Conservation and Recovery Act (RCRA) as enacted by the Hazardous and Solid Waste Amendments on November 8, 1984, the Environmental Protection Agency (EPA) is establishing best demonstrated available technology (BDAT) treatment standards for K021 waste (aqueous spent antimony catalyst waste from fluoromethanes production). Compliance with the BDAT treatment standards is a prerequisite for the placement of the waste in facilities designated as land disposal units according to 40 CFR Part 268. The effective date of the K021 treatment standards is May 8, 1990.

This background document provides the Agency's technical support and rationale for selecting and developing the proposed treatment standards for the constituents to be regulated in K021 waste. This document explains how EPA determines BDAT, selects constituents for regulation, and calculates treatment standards. Section 2 presents waste-specific information--the number and location of facilities affected by the land disposal restrictions, the waste-generating process, and waste characterization data. These data serve as a basis for determining whether a variance from treatment standards may be warranted for a particular type of K021 that is more difficult to treat than the wastes that were analyzed in developing the treatment standards for K021. Section 3 discusses the technologies used to treat the waste (or similar wastes), and Section 4 presents available performance data, including data on which the proposed treatment standards are based. Section 5 explains EPA's determination of BDAT, while Section 6 discusses the selection of constituents to be regulated. The treatment standards are determined in Section 7.

The BDAT program, the Agency's legal authority, and promulgated methodology are described in detail in two additional documents: Methodology for Developing BDAT Treatment Standards (USEPA 1989a) and Generic Quality Assurance Project Plan for Land Disposal Restrictions Program ("BDAT") (USEPA 1987). The petition process to be followed in requesting a variance from the BDAT treatment standards is also discussed in the methodology document.

Under 40 CFR 261.32 wastes identified as K021 are listed as follows: aqueous spent antimony catalyst from fluoromethanes production. The Agency believes there are no facilities generating this waste.

Three constituents (carbon tetrachloride, chloroform, and antimony) are being proposed for regulation in both nonwastewater and wastewater forms of K021 waste. For the purpose of determining the applicability of the treatment standards, wastewaters are defined as wastes containing less than 1 percent (weight basis) total suspended solids* and less than 1 percent (weight basis) total organic carbon (TOC). Waste not meeting this definition must comply with the treatment standards for nonwastewaters.

The Agency does not have performance data for treatment of K021; therefore, the proposed treatment standards for the regulated volatile organic constituents (carbon tetrachloride and chloroform) in both nonwastewaters and wastewaters are transferred from treatment performance data from incineration of K019 waste. The proposed treatment standards for the regulated metal constituent (antimony) in

*The term "total suspended solids" (TSS) clarifies EPA's previously used terminology of "total solids" and "filterable solids." Specifically, the quantity of total suspended solids is measured by Method 209c, Total Suspended Solids Dried at 103°105°C, in Standard Methods for the Examination of Water and Wastewater, 16th Edition (APHA, AWWA, and WPCF 1985).

both wastewaters and nonwastewaters are transferred from treatment performance data from the stabilization of K048-K052. Additionally, applicable data for antimony in nonwastewater residuals are available from vitrification of arsenic and data from EPA's Office of Water are available for treatment of antimony in wastewater residuals.

Table 1-1, following this section, lists the specific nonwastewater and wastewater treatment standards for K021 waste. The treatment standards for organics and metal wastewaters reflect the total constituent concentration; the units are mg/kg (parts per million on a weight-by-weight basis) for the nonwastewaters and mg/l (parts per million on a weight-by-volume basis) for the wastewaters. The units for leachate analysis are mg/l (parts per million on a weight-by-volume basis). Note that if the concentrations of the regulated constituents in the waste, as generated, are lower than or equal to the treatment standards, then treatment will not be required prior to land disposal.

Table 1-1 Treatment Standards for K021 Waste

Constituent	Maximum for any single grab sample		
	Nonwastewaters		Wastewaters
	Total concentration (mg/kg)	TCLP leachate concentration (mg/l)	Total concentration (mg/l)
<u>Volatile organics</u>			
Carbon tetrachloride	6.2	NA	0.008
Chloroform	6.2	NA	0.008
<u>Metals</u>			
Antimony	NA	0.23 or 5.6 (EPTox for arsenic)	0.60 ^a

NA = Not applicable.

^aData from EPA's Office of Water has also been analyzed to set a proposed standard for antimony in wastewaters of 1.9 mg/l. This process is analyzed in detail in Sections III.A.2.a.(3.) and III.A.1.h.(b.) of the preamble.

2. INDUSTRY AFFECTED AND WASTE CHARACTERIZATION

According to 40 CFR 261.32, the K021 waste is defined as:

K021: Aqueous spent antimony catalyst waste from fluoromethanes production.

Commercial fluoromethane compounds actually are fluorinated chloromethane compounds; therefore, the term fluoromethane refers to chlorofluoromethane (or fluoro-chloromethane) compounds.

2.1 Industry Affected and Process Description

K021 waste was formerly generated by the industrial organic chemicals industry (Standard Industrial Classification (SIC) code 2869). The Agency, after consulting the TSDR survey, knows of no facilities that currently generate K021 waste. The Agency has no current information on the process by which the waste is generated. The following description of the process was found in the RCRA Listing Background Document (USEPA 1980).

Chlorofluoromethanes are manufactured by the fluorination of chlorocarbons and are commonly used as refrigeration agents. The commercial products produced by this segment of the fluorocarbon industry include chlorotrifluoromethane (CClF_3), dichloro-difluoromethane (CCl_2F_2), trichlorofluoromethane (CCl_3F), and chlorodifluoromethane (CHClF_2).

Chlorofluoromethanes are manufactured by fluorinating either carbon tetrachloride (CCl_4) or chloroform (CHCl_3), using hydrogen fluoride (HF) and antimony pentachloride (SbCl_5) as catalysts (see Figure 2-1). Carbon tetrachloride is used as a starting material when trichlorofluoromethane (CCl_3F), dichlorodifluoromethane (CCl_2F_2), and chlorotrifluoromethane (CClF_3) are the desired products.

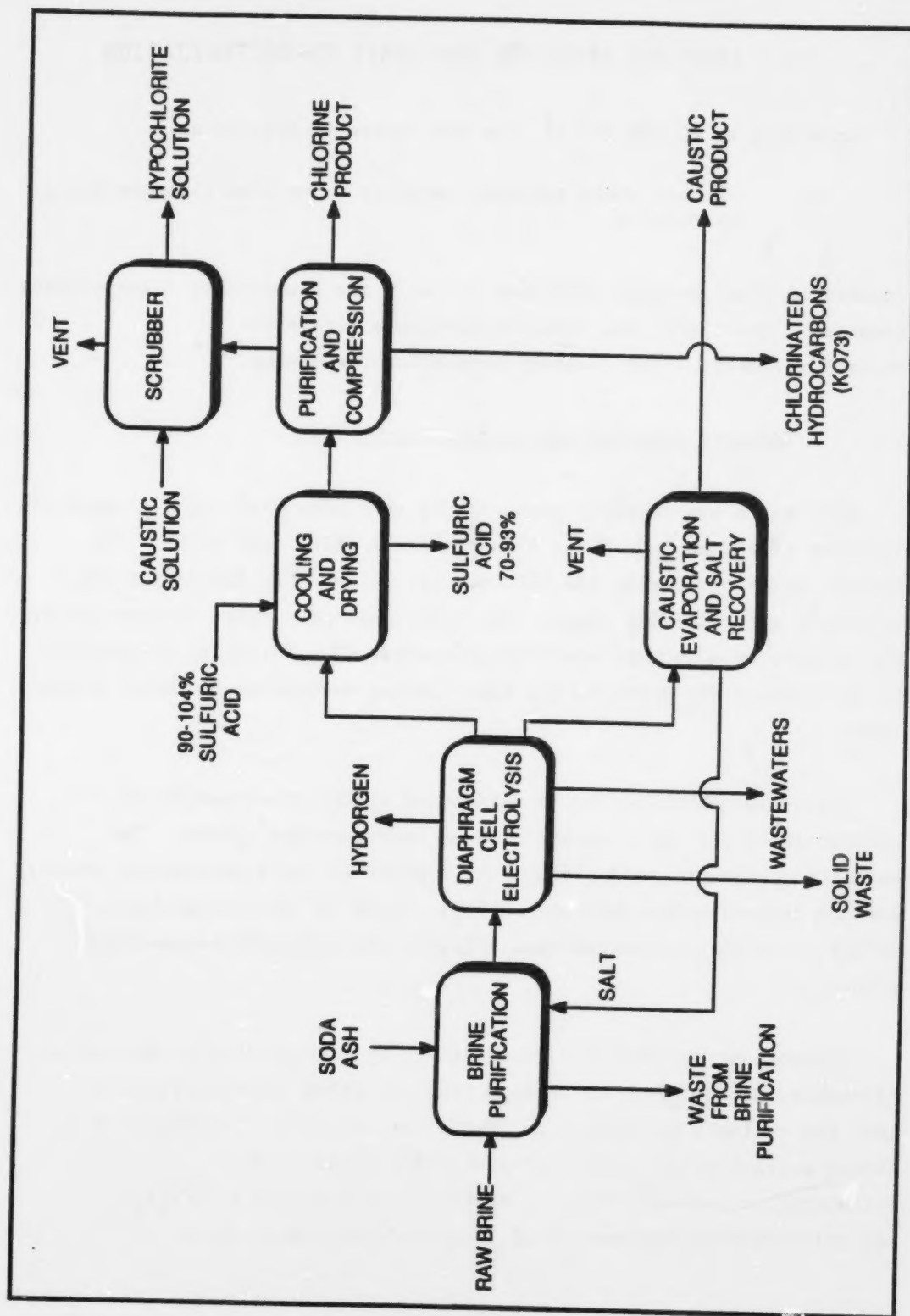


FIGURE 2-1. CHLOR-ALKALI MANUFACTURE DIAPHRAGM CELL PROCESS/GRAPHITE ANODES

Tetrafluoromethane (CF_4) is also formed as a coproduct waste. Chloroform is used as feedstock when chlorodifluoromethane (CHClF_2) and dichlorofluoromethane (CHCl_2F) are the desired products. Small amounts of trichlorotrifluoroethane ($\text{C}_2\text{Cl}_3\text{F}_3$) and trifluoromethane (CHF_3) are formed as coproduct wastes.

In both processes, the chlorine in the starting materials is successively replaced with fluorine. For example, starting with carbon tetrachloride (CCl_4) and hydrogen fluoride, the reaction is carried out continuously to produce the product mix desired, usually a 50/50 blend of trichlorofluoromethane (CCl_3F) and dichlorodifluoromethane (CCl_2F_2), as illustrated by the following equations:



The unit operations of the process are detailed in Figure 2-1. In generating the listed waste K021, the antimony pentachloride catalyst (SbCl_5) is reduced to antimony trichloride (SbCl_3). A slip stream is taken from (A) (see Figure 2-1) to remove a portion of the spent catalyst. After washing, the aqueous spent catalyst waste (B) is sent to pits (C) where it is either disposed of or stored until further treatment. (The bulk of the antimony trichloride is recovered by the catalyst filter, dried, and reactivated by chlorination to form antimony pentachloride, which is recycled to the fluorinator.)

2.2 Waste Characterization

Limited compositional data on K021 are available from the RCRA Listing Background Document (USEPA 1980) and the TSDR generator survey. These data indicate that chloroform, carbon tetrachloride, and antimony are the constituents of concern in K021 waste. No approximate percentages of the amounts of these constituents are given for K021.

3. APPLICABLE AND DEMONSTRATED TREATMENT TECHNOLOGIES

This section identifies the treatment technologies that are applicable to K021 waste and determines which, if any, of the applicable technologies can be considered demonstrated for the purposes of establishing BDAT.

To be applicable, a technology must be theoretically usable to treat the waste in question, or to treat a waste that is similar in terms of the parameters that affect treatment selection. (For detailed descriptions of the technologies applicable for these wastes, or for wastes judged to be similar, see EPA's Treatment Technology Background Document (USEPA 1989b).) To be demonstrated, the technology must be employed in full-scale operation for the treatment of the waste in question or a similar waste. Technologies available only at research facilities or in pilot- and bench-scale operations are not considered in identifying demonstrated technologies.

3.1 Applicable Treatment Technologies

As explained in Section 2.2, K021 waste is believed to contain primarily organic constituents and antimony. Applicable technologies for organic constituents in a waste or in any resulting treatment residuals include technologies that recover, destroy or, reduce the amount of the constituents in the waste. Applicable technologies for metals could include those that remove or prevent migration of metal constituents from a waste.

The Agency has identified fuel substitution and incineration as applicable technologies for treating the organic constituents in untreated K021 waste. These treatment technologies were identified based on current literature sources, field testing, and current waste treatment

practices. As treatment processes, fuel substitution and incineration have the same purpose: to thermally destroy the organic constituents in the waste by converting them to carbon dioxide and water. Fuel substitution, in addition, uses the waste as a substitute for conventional fuels burned in high-temperature industrial processes. Both fuel substitution and incineration generally result in nonwastewater and wastewater treatment residuals such as ash, clarifier solids from the flue gas scrubber system, and scrubber water. The residuals from treatment of K021 waste in a well-designed, well-operated fuel substitution combustion device or incinerator are not expected to contain detectable levels of organic constituents and thus should not require further treatment for organics.

EPA does not believe that K021 wastewaters, other than scrubber waters from incineration of K021, are likely to be generated. Hence no technologies are being discussed for removal of chlorinated organics from K021 wastewaters. (Scrubber waters from K021 incineration should be devoid of organics.)

Because K021 waste contains antimony, a BDAT list metal, residuals are expected to contain treatable levels of antimony. Therefore, stabilization and vitrification for nonwastewaters and chemical precipitation for wastewaters are considered applicable technologies for the treatment of antimony in K021 waste. Additionally, a treatment train of lime conditioning followed by sedimentation and filtration is applicable for antimony treatment in wastewaters according to the proposed best demonstrated available technology (BDAT) background document for wastewaters containing BDAT list constituents (USEPA 1989d).

Stabilization is a treatment technology applicable to wastes containing leachable metals and having a high filterable solids content, low total organic carbon (TOC) content, and low oil and grease content.

It is commonly used to treat incinerator ash that leaches metals. In stabilization, leachable metals in a waste are immobilized following the addition of stabilizing agents and other chemicals.

Vitrification is a process wherein waste or a wastewater solution is blended into a mixture of lime, soda ash, silica, and other ingredients normally used for glass-making. Waste may also be blended into metallurgical slags. The blended waste and glass or slag constituent mixture is then fed to a glass-making or other appropriate furnace. In glassmaking, material is normally introduced to the top of the furnace and falls to the surface of a pool of molten glass maintained at 1100° to 1200°C. At these temperatures organic constituents of the waste are combusted, and inorganic constituents dissolve into the glass melt. Molten glass is withdrawn from the base of the furnace and cooled into chunks or blocks. The waste inorganic constituents become physically and chemically incorporated into the glass matrix and leaching is reduced.

Chemical precipitation is a treatment technology applicable to wastewaters containing a wide range of dissolved and other metals. This technology removes these metals from solution in the form of insoluble solid precipitates. The solids are then separated from the wastewater by settling, clarification, and/or polishing filtration.

3.2 Demonstrated Technologies

There are currently no known generators of K021 waste; therefore, the Agency has no data indicating that incineration or fuel substitution is currently being used on K021 waste. The Agency does have data, however, on incineration of K019, a waste believed to be similar to K021. Both K019 and K021 are generated by the organic chemicals industry and contain similar constituents. Both chloroform and carbon tetrachloride, the

organic constituents of concern in K021, are present at treatable levels in K019. The Agency believes, therefore, that incineration would be a demonstrated technology for K021 waste.

The Agency has no evidence that fuel substitution is being used on wastes having similar chlorinated organic concentrations. When chlorinated hydrocarbons are combusted, hydrogen chloride gas or chlorine gas may be produced. These may not be compatible with normal fuel uses in industrial furnaces or boilers, in that the gases may be corrosive to furnace material of construction or not compatible with furnace product quality. Thus EPA does not believe that fuel substitution would be a demonstrated technology for K021 waste. Incineration, therefore, is the only demonstrated technology for organics removal in K021 waste.

The Agency has no data indicating that chemical precipitation is being used on K021 waste or on any other waste containing antimony. Chemical precipitation is, therefore, not a demonstrated technology for removal of antimony from wastewaters. The Agency does have data that show treatment of antimony in wastewaters by lime conditioning followed by sedimentation and filtration. These data are available in the background document on wastewaters (USEPA 1989d). Additionally, the Agency has no data to indicate that stabilization is being used on K021 waste or any other waste with treatable concentrations of antimony. Only inconclusive data are available on antimony stabilization for K048-K052 (see Table 4-13). These data show the concentration of antimony increasing after stabilization. Therefore, stabilization is not considered to be a demonstrated technology for metals treatment in K021 nonwastewaters. Data are available for the slag vitrification of arsenic in the proposed background document for arsenic and selenium wastes (USEPA 1989c), and the Agency believes these data are applicable and demonstrated for antimony in nonwastewater residuals. Additionally, the Agency has searched available literature (Tooley 1984) and learned that

antimony oxide (Sb_2O_3) is often in vitrified in concentrations up to 1 percent in glassmaking.

Consequently, the only demonstrated treatment technology for antimony-containing nonwastewaters is vitrification. There are no demonstrated treatment technologies for antimony-containing wastewaters.

4. PERFORMANCE DATA BASE

This section presents the data available to EPA on the performance of demonstrated technologies in treating the listed wastes. These data are used elsewhere in this document for determining which technologies represent BDAT (Section 5), for selecting constituents to be regulated (Section 6), and for developing treatment standards (Section 7). Eligible data, in addition to full-scale demonstration data, may include data developed at research facilities or obtained through other applications at less than full-scale operation, as long as the technology is demonstrated in full-scale operation for a similar waste or wastes as defined in Section 3.

Performance data, to the extent that they are available to EPA, include the untreated and treated waste concentrations for a given constituent, values of operating parameters that were measured at the time the waste was being treated, values of relevant design parameters for the treatment technology, and data on waste characteristics that affect performance of the treatment technology.

Where data are not available on the treatment of the specific wastes of concern, the Agency may elect to transfer data on the treatment of a similar waste or wastes, using a demonstrated technology. To transfer data from another waste category, EPA must find that the wastes covered by this background document are no more difficult to treat (based on the waste characteristics that affect performance of the demonstrated treatment technology) than the treated wastes from which performance data are being transferred.

No performance data are available to the Agency to characterize treatment for K021. However, the Agency has data for incineration of a similar organic waste, K019, which, as defined by 40 CFR 261.32, is the

heavy ends from the distillation of ethylene dichloride in ethylene dichloride production. This similarity is based on the production processes, the waste compositions, and the waste characteristics affecting performance of the demonstrated treatment technology. Both K019 and K021 are produced by using a hydrogen halide or halogen feedstock and distilling until the desired product is formed. (Section 2 of this background document details the K021 process description; Section 2 of the K019 background document (USEPA 1988a) presents the K019 process description.) K021 is expected to contain chloroform and carbon tetrachloride in high quantities, constituents that are also present in K019. As discussed in the Treatment Technology Background Document (USEPA 1989b) the waste characteristics affecting performance of incineration are thermal conductivity of the waste and the boiling points and bond dissociation energies of the constituents of concern. Evaluation of the waste composition for K021 reveals that the primary constituents of concern in K021 (i.e., chloroform and carbon tetrachloride) have boiling points and bond dissociation energies lower than those of most constituents present in K019. (See Tables 4-1 through 4-12.) Therefore, the Agency is transferring performance data for organics from the treatment of K019 to the K021 wastes since the Agency believes that K021 is no more difficult to treat than the tested K019 waste.

The performance data for K019 waste include the untreated and treated waste concentrations for certain constituents, the values of operating parameters that were measured at the time the waste was being treated, the values of relevant design parameters for the treatment technology tested, and data on waste characteristics that affect the performance of the treatment technology.

Tables 4-1 through 4-12 present the data of BDAT list constituent analyses for treated and untreated K019 waste, as well as the design and

operating data for the incineration treatment system. Based on a review of the operating data obtained during collection of the samples, the data sets appear to reflect treatment by a well-operated system. This is further evidenced by the fact that in all cases the BDAT list organics detected in the K019 untreated waste are reduced to nondetectable levels in the treated residuals.

Because one BDAT list metal, antimony, is expected to be present in the untreated K021 waste, it is also expected to be found in K021 treatment residuals, (i.e., incinerator ash, incinerator scrubber water, and stack gas). No performance data are available for treatment of antimony in K021 wastewaters and nonwastewaters, and inconclusive performance data are available for treatment of antimony in all other waste codes for which EPA has treatment data. Some of these inconclusive data for treatment of antimony from K048-K052 appear in Table 4-13. Also, data from the vitrification of arsenic appear in Table 4-14, and these data may be used for treatment of antimony in nonwastewater residuals.

Recently, additional wastewater treatment data primarily from EPA's Office of Water have been analyzed for the development of concentration-based treatment standards for many wastes including K021. These data were not originally developed for K021 waste but they do contain wastewater treatment data for antimony. While these data were not available in time to incorporate into the preamble discussion or waste groups, these data are being placed in the administrative record for today's notice. Furthermore, the Agency has decided to propose alternative concentration-based treatment standards, based on the aforementioned data for all the above wastes and antimony in K021 wastewaters for which standards based on incineration scrubber waters have been proposed. Further information on these alternative standards can be found in Sections III.A.2.a.(3.) and III.A.1.h(b) of the preamble

and in the document "Best Demonstrated Available Technology (BDAT) Background Document for Wastewaters Containing BDAT List Constituents" that can be found in the RCRA docket.

EPA has data for antimony in scrubber water from thermal treatment (not incineration) of a mercury waste containing antimony. This mercury waste is not organic in nature, nor has it been treated by incineration. The Agency is, therefore, not using these data because they are not as representative as data from K048-K052. Additional data on antimony have been requested from industry in the proposed preamble and, if available, will be presented as part of the final background document for K021 waste.

Table 4-1 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #1

Detected BDAT List Organic Constituents	Untreated Waste		Treated Waste
	K019 Concentration mg/kg (ppm)	RCRA Blend* Concentration mg/kg (ppm)	Kiln Ash Concentration mg/kg (ppm)
<u>VOLATILES</u>			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	4,000	<8	<2
9. Chlorobenzene	3,000	<8	<2
14. Chloroform	4,600	<8	<2
22. 1,1-Dichloroethane	2,200	<8	<2
23. 1,2-Dichloroethane	93,000	<8	<2
34. Methyl ethyl ketone	<1,000	940	<10
38. Methylene chloride	<1,000	910	<10
42. Tetrachloroethene	7,300	490	<2
43. Toluene	<200	2,300	<2
45. 1,1,1-Trichloroethane	81,000	130	<2
47. Trichloroethene	3,210	360	<2
215-217. Xylene (total)	<200	3,400	<2
222. Acetone	<1,000	1,200	<10
226. Ethyl benzene	<200	2,200	<2
229. Methyl isobutyl ketone	<1,000	1,100	<10
<u>SEMIVOLATILES</u>			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	280	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	81	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	20	53	<2
110. Hexachlorobenzene	69	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-1 (Continued)

SAMPLE SET #1 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste		Treated Waste	
	K019	RCRA Blend*	Kiln Ash	Kiln As
	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	TCLP mg/L (ppm)
<u>SEMIVOLATILES (Continued)</u>				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	120	<100	<10	
121. Naphthalene	470	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	61	<100	<10	
141. Phenanthrene	21	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	76	<50	<5	
150. 1,2,4-Trichlorobenzene	100	<50	<5	
<u>Detected BDAT List Metal and Inorganic Constituents</u>				
<u>METALS</u>				
154. Antimony	<6.0	24	8.0	<0.060
155. Arsenic	1.2	94	3.6	<0.002
156. Barium	0.97	1.3	26	0.033
158. Cadmium	0.63	<0.3	0.66	<0.003
159. Chromium	4.0	40	44	0.200
160. Copper	2.1	165	2,370	2.690
161. Lead	3.4	27	120	0.380
163. Nickel	3.0	8.8	66	0.680
165. Silver	<0.9	<0.9	3.3	<0.009
167. Vanadium	<2.0	2.2	4.1	<0.020
168. Zinc	5.8	4,170	12	0.052
<u>INORGANICS</u>				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	38	
171. Sulfide	790	830	68	

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-1 (Continued)

SAMPLE SET #1 (Continued)

DESIGN AND OPERATING PARAMETERS

<u>Parameter</u>	<u>Design</u>	<u>Operating Value</u>
Kiln Temperature (°F)+	*	1825-1900
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 13.1 RCRA Blend, Waste Burner #1: 3.9-5.5 RCRA Blend, Waste Burner #2: 4.4-9.7
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-2 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #2

Detected BDAT List Organic Constituents	Untreated Waste		Treated Waste
	K019	RCRA Blend*	Kiln Ash
	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)
<u>VOLATILES</u>			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	3,800	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	5,800	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	96,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	6,700	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	33,000	130	<2
47. Trichloroethene	2,400	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
<u>SEMIVOLATILES</u>			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	280	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	74	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	16	53	<2
110. Hexachlorobenzene	60	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-2 (Continued)

SAMPLE SET #2 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste		Treated Waste	
	K019	RCRA Blend*	Kiln Ash	Kiln Ash
	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	TCLP mg/L (ppm)
<u>SEMIVOLATILES (Continued)</u>				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	85	<100	<10	
121. Naphthalene	314	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	51	<100	<10	
141. Phenanthrene	15	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	62	<50	<5	
150. 1,2,4-Trichlorobenzene	65	<50	<5	
<u>Detected BDAT List Metal and Inorganic Constituents</u>				
<u>METALS</u>				
154. Antimony	<6.0	24	6.8	<0.060
155. Arsenic	<0.2	94	2.8	<0.002
156. Barium	<0.9	1.3	23	0.036
158. Cadmium	0.46	<0.3	0.96	0.004
159. Chromium	3.4	40	60	0.130
160. Copper	1.7	165	3,430	2.380
161. Lead	2.3	27	42	0.260
163. Nickel	3.6	8.8	89	0.560
165. Silver	<0.9	<0.9	3.4	<0.009
167. Vanadium	<2.0	2.2	4.8	<0.020
168. Zinc	6.9	4,170	13	0.071
<u>INORGANICS</u>				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	5.1	
171. Sulfide	NA	830	<50	

NA Not Analyzed.

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-2 (Continued)

SAMPLE SET #2 (Continued)

DESIGN AND OPERATING PARAMETERS

<u>Parameter</u>	<u>Design</u>	<u>Operating Value</u>
Kiln Temperature (°F)+	*	1800-1880
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 12.2 RCRA Blend, Waste Burner #1: 5.2-5.5 RCRA Blend, Waste Burner #2: 4.4-9.7 0.19-0.21
Kiln Rotational Speed (RPM)	*	

*This information has been claimed as RCRA Confidential Business Information.

Table 4-3 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #3

Detected BDAT List Organic Constituents	Untreated Waste		Treated Waste
	K019	RCRA Blend*	Kiln Ash
	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)
<u>VOLATILES</u>			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	3,500	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	5,000	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	87,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	6,000	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	34,000	130	<2
47. Trichloroethene	2,200	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
<u>SEMIVOLATILES</u>			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	290	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	80	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	19	53	<2
110. Hexachlorobenzene	73	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.
* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-3 (Continued)

SAMPLE SET #3 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste		Treated Waste	
	K019	RCRA Blend*	Kiln Ash	Kiln As
	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	TCLP mg/L (ppm)
<u>SEMIVOLATILES (Continued)</u>				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	95	<100	<10	
121. Naphthalene	350	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	59	<100	<10	
141. Phenanthrene	11	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	67	<50	5	
150. 1,2,4-Trichlorobenzene	70	<50	<5	
<u>Detected BDAT List Metal and Inorganic Constituents</u>				
<u>METALS</u>				
154. Antimony	<6.0	24	9.2	<0.060
155. Arsenic	<0.2	94	5.7	<0.002
156. Barium	<0.9	1.3	54	0.057
158. Cadmium	0.53	<0.3	3.6	0.005
159. Chromium	3.5	40	202	0.260
160. Copper	1.7	165	2,290	7.030
161. Lead	3.4	27	118	0.620
163. Nickel	2.3	8.8	169	0.960
165. Silver	<0.9	<0.9	1.9	<0.009
167. Vanadium	<2.0	2.2	6.0	<0.020
168. Zinc	4.4	4,170	16	0.170
<u>INORGANICS</u>				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	6.1	
171. Sulfide	NA	830	64	

NA = Not Analyzed.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-3 (Continued)

SAMPLE SET #3 (Continued)

DESIGN AND OPERATING PARAMETERS

<u>Parameter</u>	<u>Design</u>	<u>Operating Value</u>
Kiln Temperature (°F)+	*	1850-1900
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 12.4
		RCRA Blend,
		Waste Burner #1: 5.2-5.8
		RCRA Blend,
Kiln Rotational Speed (RPM)	*	Waste Burner #2: 4.4-8.4
		0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-4 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #4

Detected BDAT List Organic Constituents	Untreated Waste		Treated Waste
	K019	RCRA Blend*	Kiln Ash
	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)
<u>VOLATILES</u>			
4. Benzene			
7. Carbon tetrachloride	<2,000	2,000	<2
9. Chlorobenzene	3,900	<8	<2
14. Chloroform	<2,000	<8	<2
22. 1,1-Dichloroethane	5,300	<8	<2
23. 1,2-Dichloroethane	<2,000	<8	<2
34. Methyl ethyl ketone	122,000	<8	<2
38. Methylene chloride	<10,000	940	<2
42. Tetrachloroethene	<10,000	910	<10
43. Toluene	7,200	490	<10
45. 1,1,1-Trichloroethane	<2,000	2,300	<2
47. Trichloroethene	44,000	130	<2
215-217. Xylene (total)	2,300	360	<2
222. Acetone	<2,000	3,400	<2
226. Ethyl benzene	<10,000	1,200	<2
229. Methyl isobutyl ketone	<2,000	2,200	<10
	<10,000	1,100	<2
			<10
<u>SEMIVOLATILES</u>			
51. Acenaphthalene			
57. Anthracene	<10	150	<2
65. Benzo(k)fluoranthene	<10	110	<2
68. Bis(2-chloroethyl) ether	<10	67	<2
70. Bis(2-ethylhexyl) phthalate	310	<20	<2
80. Chrysene	<10	40	<2
87. o-Dichlorobenzene	SNA	28	12
88. p-Dichlorobenzene	<10	250	<2
98. Di-n-butyl phthalate	84	32	<2
108. Fluoranthene	<10	31	<2
109. Fluorene	<10	120	230
110. Hexachlorobenzene	21	53	<2
	61	<100	<2
			<10

SNA A standard is not available

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.
*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

SAMPLE SET #4 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste		Treated Waste	
	K019	RCRA Blend*	Kiln Ash	Kiln As
	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	TCLP mg/L (ppm)
<u>SEMIVOLATILES (Continued)</u>				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	94	<100	<10	
121. Naphthalene	360	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	64	<100	<10	
141. Phenanthrene	19	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	82	<50	<5	
150. 1,2,4-Trichlorobenzene	74	<50	<5	
<u>Detected BDAT List Metal and Inorganic Constituents</u>				
<u>METALS</u>				
154. Antimony	<6.0	24	<6.0	<0.060
155. Arsenic	<0.2	94	5.7	<0.002
156. Barium	<0.9	1.3	8.4	0.036
158. Cadmium	<0.3	<0.3	<0.3	0.005
159. Chromium	1.8	40	28	0.110
160. Copper	<1.0	165	1,270	1.940
161. Lead	2.4	27	25	0.320
163. Nickel	2.2	8.8	69	0.870
165. Silver	<0.9	<0.9	2.6	<0.009
167. Vanadium	<2.0	2.2	<2.0	<0.020
168. Zinc	9.4	4,170	11	0.056
<u>INORGANICS</u>				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	3.2	
171. Sulfide	NA	830	<50	

NA = Not Analyzed.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

SAMPLE SET #4 (Continued)

DESIGN AND OPERATING PARAMETERS

<u>Parameter</u>	<u>Design</u>	<u>Operating Value</u>
Kiln Temperature (°F)+	*	1775-1900
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 12.7 RCRA Blend, Waste Burner #1: 5.2-5.8 RCRA Blend, Waste Burner #2: 4.4-7.3
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-5 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #5

Detected BDAT List Organic Constituents	Untreated Waste		Treated Was
	K019	RCRA Blend*	Kiln Ash
	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	Concentrati mg/kg (ppm)
<u>VOLATILES</u>			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	4,000	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	6,000	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	130,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	7,800	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	45,000	130	<2
47. Trichloroethene	2,500	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
<u>SEMIVOLATILES</u>			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	340	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	90	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	19	53	<2
110. Hexachlorobenzene	87	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

SAMPLE SET #5 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste		Treated Waste	
	K019	RCRA Blend*	Kiln Ash	Kiln As:
	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	TCLP mg/L (ppm)
<u>SEMIVOLATILES (Continued)</u>				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	113	<100	<10	
121. Naphthalene	371	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	63	<100	<10	
141. Phenanthrene	19	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	73	<50	<5	
150. 1,2,4-Trichlorobenzene	72	<50	<5	
<u>Detected BDAT List Metal and Inorganic Constituents</u>				
<u>METALS</u>				
154. Antimony	<6.0	24	9.1	<0.060
155. Arsenic	<0.2	94	3.9	<0.002
156. Barium	<0.9	1.3	21	0.054
158. Cadmium	0.36	<0.3	1.2	0.006
159. Chromium	3.2	40	125	0.210
160. Copper	2.1	165	2,780	2.140
161. Lead	2.5	27	86	0.290
163. Nickel	4.8	8.8	166	1.270
165. Silver	<0.9	<0.9	3.3	<0.009
167. Vanadium	<2.0	2.2	5.7	<0.020
168. Zinc	4.7	4,170	22	0.086
<u>INORGANICS</u>				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	23	
171. Sulfide	NA	830	64	

NA = Not Analyzed.

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

SAMPLE SET #5 (Continued)

DESIGN AND OPERATING PARAMETERS

<u>Parameter</u>	<u>Design</u>	<u>Operating Value</u>
Kiln Temperature (°F)+	*	1775-1800
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 11.7
		RCRA Blend,
		Waste Burner #1: 5.5-6.0
		RCRA Blend,
Kiln Rotational Speed (RPM)	*	Waste Burner #2: 5.2-9.7
		0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-6 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #6

Detected BDAT List Organic Constituents	Untreated Waste		Treated Waste
	K019 Concentration mg/kg (ppm)	RCRA Blend* Concentration mg/kg (ppm)	Kiln Ash Concentration mg/kg (ppm)
<u>VOLATILES</u>			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	4,100	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	5,600	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	98,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	6,900	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	44,000	130	<2
47. Trichloroethene	2,500	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
<u>SEMIVOLATILES</u>			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	330	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	90	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	22	53	<2
110. Hexachlorobenzene	66	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-6 (Continued)

SAMPLE SET #6 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste		Treated Waste	
	K019	RCRA Blend*	Kiln Ash	Kiln Ash
	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	Concentration mg/kg (ppm)	TCLP mg/L (ppm)
<u>SEMIVOLATILES (Continued)</u>				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	88	<100	<10	
121. Naphthalene	390	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	65	<100	<10	
141. Phenanthrene	17.	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	86	<50	<5	
150. 1,2,4-Trichlorobenzene	79	<50	<5	
<u>Detected BDAT List Metal and Inorganic Constituents</u>				
<u>METALS</u>				
154. Antimony	<6.0	24	9.6	< 0.06
155. Arsenic	<0.2	94	2.3	<0.002
156. Barium	<0.9	1.3	11	0.027
158. Cadmium	0.62	<0.3	2.2	0.006
159. Chromium	5.3	40	141	0.092
160. Copper	3.6	165	2,520	2.400
161. Lead	3.5	27	34	0.270
163. Nickel	6.0	8.8	288	0.690
165. Silver	<0.9	<0.9	3.1	<0.009
167. Vanadium	<2.0	2.2	8.7	<0.020
168. Zinc	8.4	4,170	13	0.061
<u>INORGANICS</u>				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	4.7	
171. Sulfide	NA	830	92	

NA = Not Analyzed.

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-6 (Continued)

SAMPLE SET #6 (Continued)

DESIGN AND OPERATING PARAMETERS

<u>Parameter</u>	<u>Design</u>	<u>Operating Value</u>
Kiln Temperature (°F)+	*	1775-1850
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 11.5
		RCRA Blend,
		Waste Burner #1: 5.2-5.8
		RCRA Blend,
Kiln Rotational Speed (RPM)	*	Waste Burner #2: 5.2-9.7
		0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-7

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #1

Detected BDAT List Organic Constituents	Untreated Waste Concentration			Treated Waste	
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan- Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
<u>VOLATILES</u>					
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002
7. Carbon tetrachloride	4,000	<8	<2,000	1.90	<0.002
9. Chlorobenzene	3,000	<8	<2,000	<0.4	<0.002
14. Chloroform	4,600	<8	<2,000	<0.4	<0.002
21. Dichlorodifluoromethane	<200	<8	<2,000	<0.4	<0.002
22. 1,1-Dichloroethane	2,200	<8	<2,000	<0.4	<0.002
23. 1,2-Dichloroethane	93,000	<8	<2,000	<0.4	<0.002
34. Methyl ethyl ketone	<1,000	940	<10,000	3.5	<0.01
38. Methylene chloride	<1,000	910	<10,000	<2.0	<0.01
42. Tetrachloroethene	7,300	490	<2,000	<0.4	<0.002
43. Toluene	<200	2,300	41,000	3.7	<0.002
45. 1,1,1-Trichloroethane	81,000	130	<2,000	2.3	<0.002
47. Trichloroethene	3,210	360	3,600	<0.4	<0.002
215-217. Xylene (total)	<200	3,400	36,000	4.4	<0.002
222. Acetone	<1,000	1,200	<10,000	<2.0	<0.01
226. Ethyl benzene	<200	2,200	16,000	4.1	<0.002
229. Methyl isobutyl ketone	<1,000	1,100	<10,000	<2.0	<0.01
<u>SEMI-VOLATILES</u>					
51. Acenaphthalene	<10	150	120	<0.002	<0.002
52. Acenaphthene	<10	<20	480	<0.002	<0.002
56. Aniline	<25	<50	<250	1.22	<0.005
57. Anthracene	<10	110	400	<0.002	<0.002
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002
68. Bis(2-chloroethyl) ether	280	<20	<100	<0.002	<0.002
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-7 (Cont Inued)

SAMPLE SET #1 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration			Treated Waste	
	K019 mg/kg (ppm)	RCRA Blend [#] mg/kg (ppm)	PCB Blend [#] mg/kg (ppm)	Mercaptan- Contaminated Waste [#] mg/L (ppm)	Scrubber Water mg/L (ppm)
<u>SEMIVOLATILES (Continued)</u>					
80. Chrysene	SNA	28	<100	<0.002	<0.002
81. ortho-Cresol	<10	<20	<100	0.020	<0.002
87. o-Dichlorobenzene	<10	250	1,060	2.55	<0.002
88. p-Dichlorobenzene	81	32	460	0.260	<0.002
90. 2,4-Dichlorophenol	<25	<50	<250	0.420	<0.002
91. 2,6-Dichlorophenol	<25	<50	500	0.430	<0.005
98. DI-n-butyl phthalate	<10	31	120	0.012	<0.005
104. DI-n-octyl phthalate	<10	<20	430	<0.002	<0.002
108. Fluoranthene	<10	120	300	<0.002	<0.002
109. Fluorene	20	53	340	<0.002	<0.002
110. Hexachlorobenzene	69	<100	<500	0.022	<0.002
111. Hexachlorobutadiene	<50	210	<500	0.079	<0.010
113. Hexachloroethane	120	<100	<500	0.018	<0.010
121. Naphthalene	470	<20	400	0.133	<0.010
122. 1,4-Naphthoquinone	<10	<20	<100	0.078	<0.002
126. Nitrobenzene	<25	3,400	8,200	0.027	<0.002
136. Pentachlorobenzene	61	<100	1,000	0.020	<0.005
141. Phenanthrene	21	240	950	<0.002	<0.010
142. Phenol	<10	78	1,000	4.56	<0.002
145. Pyrene	<10	200	260	<0.002	<0.002
148. 1,2,4,5-Tetrachlorobenzene	76	<50	1,400	0.008	<0.002
150. 1,2,4-Trichlorobenzene	100	<50	19,000	1.24	<0.005
152. 2,4,6-Trichlorophenol	<50	<100	<500	0.037	<0.005

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-7 (Cont Inued)

SAMPLE SET #1 (Cont Inued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration			Treated Waste	
	KO19 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan- Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.41
155. Arsenic	1.2	94	7.4	<0.020	0.046
156. Barium	0.97	1.3	<19	1.670	0.48
157. Beryllium	<0.1	<0.1	NA	<0.001	<0.001
158. Cadmium	0.63	<0.3	<33	<0.003	0.23
159. Chromium	4.0	40	23.7	<0.009	0.11
160. Copper	2.1	165	107	0.027	1.81
161. Lead	3.4	27	<7.3	0.0064	0.82
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.002
163. Nickel	3.0	8.8	6.2	0.037	0.081
165. Silver	<0.9	<0.9	<18	0.018	0.085
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.16
168. Zinc	5.8	4,170	6810	0.071	11.4
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	<5.0	31	15	0.950	20.0
171. Sulfide	790	830	16,000	17.0	<1.0
PCBs					
206. Aroclor 1260	NA	NA	33,500	NA	NA

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-7 (Continued)

SAMPLE SET #1 (Continued)

<u>DESIGN AND OPERATING PARAMETERS</u>	<u>DESIGN</u>	<u>OPERATING VALUE</u> →
Afterburner Temperature (°F)*	*	2380
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)*	*	PCB Blend Feed Rate: 36.1
		Mercaptan-Contaminated Waste
		Feed Rate: 0.18
		6.8
		NR
Excess Oxygen Concentration (%)		
Carbon Monoxide Concentration (ppm volume)		

NR Not Recorded.

*This information has been claimed as RCRA Confidential Business Information.

Table 4-8 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #2

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste	
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan- Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)	
VOLATILES						
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002	
7. Carbon tetrachloride	3,800	<8	<2,000	1.90	<0.002	
9. Chlorobenzene	<2,000	<8	<2,000	<0.4	<0.002	
14. Chloroform	5,800	<8	<2,000	<0.4	<0.002	
21. Dichlorodifluoromethane	<2,000	<8	<2,000	<0.4	<0.002	
22. 1,1-Dichloroethane	<2,000	<8	<2,000	<0.4	<0.002	
23. 1,2-Dichloroethane	96,000	<8	<2,000	<0.4	<0.002	
34. Methyl ethyl ketone	<10,000	940	<2,000	<0.4	<0.002	
38. Methylene chloride	<10,000	910	<10,000	3.5	<0.010	
42. Tetrachloroethene	6,700	490	<2,000	<2.0	<0.010	
43. Toluene	<2,000	2,300	<2,000	<0.4	<0.002	
45. 1,1,1-Trichloroethane	33,000	130	41,000	3.7	0.0032	
47. Trichloroethene	2,400	360	<2,000	2.3	<0.002	
215-217. Xylene (total)	<2,000	3,400	3,600	<0.4	<0.002	
222. Acetone	<10,000	1,200	36,000	4.4	<0.002	
226. Ethyl benzene	<2,000	2,200	<10,000	<2.0	<0.01	
229. Methyl isobutyl ketone	<10,000	1,100	16,000	4.1	<0.002	
			<10,000	<2.0	<0.01	
SEMI-VOLATILES						
51. Acenaphthalene	<10	150	120	<0.002	<0.002	
52. Acenaphthene	<10	<20	480	<0.002	<0.002	
56. Aniline	<25	<50	<250	1.22	<0.005	
57. Anthracene	<10	110	400	<0.002	<0.002	
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002	
68. Bis(2-chloroethyl) ether	280	<20	<100	<0.002	<0.002	
70. Bis(2-ethylhexyl) phthalate	<10	40	<100	0.079	<0.002	

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-8 (Continued)

SAMPLE SET #2 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste	
	KO12 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan- Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)	
<u>SEMI-VOLATILES (Continued)</u>						
80. Chrysene	SNA	28				
81. ortho-Cresol	<10	<20	<100	<0.002		<0.002
87. o-Dichlorobenzene	<10	250	<100	0.020		<0.002
88. p-Dichlorobenzene	74	32	1,060	2.55		<0.002
90. 2,4-Dichlorophenol	<25	<50	460	0.260		<0.002
91. 2,6-Dichlorophenol	<25	<50	<250	0.420		<0.005
98. Di-n-butyl phthalate	<10	31	500	0.430		<0.005
104. Di-n-octyl phthalate	<10	<20	120	0.012		0.0063
108. Fluoranthene	<10	120	430	<0.002		<0.002
109. Fluorene	16	53	300	<0.002		<0.002
110. Hexachlorobenzene	60	<100	340	<0.002		<0.002
111. Hexachlorobutadiene	<50	210	<500	0.022		<0.010
113. Hexachloroethane	85	<100	<500	0.079		<0.010
121. Naphthalene	314	<20	<500	0.018		<0.010
122. 1,4-Naphthoquinone	<10	<20	400	0.133		<0.002
126. Nitrobenzene	<25	<20	<100	0.078		<0.002
136. Pentachlorobenzene	51	3,400	8,200	0.027		<0.005
141. Phenanthrene	15	<100	1,000	0.020		<0.010
142. Phenol	<10	240	950	<0.002		<0.002
145. Pyrene	<10	78	1,000	4.56		<0.002
148. 1,2,4,5-Tetrachlorobenzene	62	200	260	<0.002		<0.002
150. 1,2,4-Trichlorobenzene	65	<50	1,400	0.008		<0.005
152. 2,4,6-Trichlorophenol	<50	<50	19,000	1.24		<0.005
		<100	<500	0.037		<0.010

SNA A standard is not available; the compound was searched using an NIS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-8 (Continued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration			Treated Waste	
	KO19 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan- Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.39
155. Arsenic	<0.2	94	7.4	<0.020	0.038
156. Barium	<0.9	1.3	<19	1.670	0.50
157. Beryllium	<0.1	<0.1	NA	<0.001	<0.001
158. Cadmium	0.46	<0.3	<33	<0.003	0.19
159. Chromium	3.4	40	23.7	<0.009	0.14
160. Copper	1.7	165	107	0.027	1.38
161. Lead	2.3	27	<7.3	0.0064	0.78
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.0026
163. Nickel	3.6	8.8	6.2	0.037	0.068
165. Silver	<0.9	<0.9	<18	0.018	0.095
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.18
168. Zinc	6.9	4,170	6810	0.071	11.0
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	<5.0	31	15	0.950	15.0
171. Sulfide	NA	830	16,000	17.0	<1.0
PCBs					
206. Aroclor 1260	NA	NA	33,500	NA	NA

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-8 (Continued)

SAMPLE SET #2 (Continued)

<u>DESIGN AND OPERATING PARAMETERS</u>	<u>DESIGN</u>	<u>OPERATING VALUE</u> →
Afterburner Temperature (°F)*	*	2400
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)*	*	PCB Blend Feed Rate: 36.5 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)*		7.0
Carbon Monoxide Concentration (ppm volume)		NR

NR Not Recorded.

*This information has been claimed as RCRA Confidential Business Information.

Table 4-9 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #3

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste	
	K019 mg/kg (ppm)	RCRA Blend [#] mg/kg (ppm)	PCB Blend [#] mg/kg (ppm)	Mercaptan- Contaminated Waste [#] mg/L (ppm)	Scrubber Water mg/L (ppm)	
VOLATILES						
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002	
7. Carbon tetrachloride	3,500	<8	<2,000	1.90	<0.002	
9. Chlorobenzene	<2,000	<8	<2,000	<0.4	<0.002	
14. Chloroform	5,000	<8	<2,000	<0.4	<0.002	
21. Dichlorodifluoromethane	<2,000	<8	<2,000	<0.4	0.0043	
22. 1,1-Dichloroethane	<2,000	<8	<2,000	<0.4	<0.002	
23. 1,2-Dichloroethane	87,000	<8	<2,000	<0.4	<0.002	
34. Methyl ethyl ketone	<10,000	940	<10,000	3.5	<0.01	
38. Methylene chloride	<10,000	910	<10,000	<2.0	<0.01	
42. Tetrachloroethene	6,000	490	<2,000	<0.4	<0.002	
43. Toluene	<2,000	2,300	41,000	3.7	0.0026	
45. 1,1,1-Trichloroethane	34,000	130	<2,000	2.3	<0.002	
47. Trichloroethene	2,200	360	3,600	<0.4	<0.002	
215-217. Xylene (total)	<2,000	3,400	36,000	4.4	<0.002	
222. Acetone	<10,000	1,200	<10,000	<2.0	<0.01	
226. Ethyl benzene	<2,000	2,200	16,000	4.1	<0.002	
229. Methyl isobutyl ketone	<10,000	1,100	<10,000	<2.0	<0.01	
SEMI-VOLATILES						
51. Acenaphthalene	<10	150	120	<0.002	<0.002	
52. Acenaphthene	<10	<20	480	<0.002	<0.002	
56. Aniline	<25	<50	<250	1.22	<0.005	
57. Anthracene	<10	110	400	<0.002	<0.002	
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002	
68. Bis(2-chloroethyl) ether	290	<20	<100	<0.002	<0.002	
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002	

[#] Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-9 (Cont Inued)

SAMPLE SET #3 (Cont Inued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste	
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan- Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)	
<u>SEMI-VOLATILES (Continued)</u>						
80. Chrysene	SNA	28	<100	<0.002		
81. ortho-Cresol	<10	<20	<100	0.020		<0.002
88. p-Dichlorobenzene	<10	250	1,060	2.55		<0.002
90. 2,4-Dichlorophenol	80	32	460	0.260		<0.002
91. 2,6-Dichlorophenol	<25	<50	<250	0.420		<0.002
98. DI-n-butyl phthalate	<25	<50	500	0.430		<0.005
104. DI-n-octyl phthalate	<10	31	120	0.012		<0.005
108. Fluoranthene	<10	<20	430	<0.002		0.0046
109. Fluorene	<10	120	300	<0.002		<0.002
110. Hexachlorobenzene	19	53	340	<0.002		<0.002
111. Hexachlorobutadiene	73	<100	<500	0.022		<0.002
113. Hexachloroethane	<50	210	<500	0.079		<0.01
121. Naphthalene	95	<100	<500	0.018		<0.01
122. 1,4-Naphthoquinone	350	<20	400	0.133		<0.01
126. Nitrobenzene	<10	<20	<100	0.078		<0.002
136. Pentachlorobenzene	<25	3,400	8,200	0.027		<0.002
141. Phenanthrene	59	<100	1,000	0.020		<0.005
142. Phenol	11	240	950	<0.002		<0.010
145. Pyrene	<10	78	1,000	4.56		<0.002
148. 1,2,4,5-Tetrachlorobenzene	<10	200	260	<0.002		<0.002
150. 1,2,4-Trichlorobenzene	67	<50	1,400	0.008		<0.002
152. 2,4,6-Trichlorophenol	70	<50	19,000	1.240		<0.005
	<50	<100	<500	0.037		<0.005
						<0.010

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-9 (Continued)

SAMPLE SET #3 (Cont Inued)		Untreated Waste Concentration				Treated Waste	
		KO12 mg/kg (ppm)	RCRA Blend# mg/kg (ppm)	PCB Blend# mg/kg (ppm)	Mercaptan- Contaminated Waste# mg/L (ppm)	Scrubber Water mg/L (ppm)	
Detected BDAT List Metal, Inorganic and PCB Constituents							
METALS							
154. Antimony		<6.0	24	<41	<0.060	0.41	
155. Arsenic		<0.2	94	7.4	<0.02	0.030	
156. Barium		<0.9	1.3	<19	1.670	0.530	
157. Beryllium		<0.1	<0.1	NA	<0.001	<0.001	
158. Cadmium		0.53	<0.3	<33	<0.003	0.150	
159. Chromium		3.5	40	23.7	<0.009	0.13	
160. Copper		1.7	165	107	0.027	1.18	
161. Lead		3.4	27	<7.3	0.0064	0.64	
162. Mercury		<0.05	<0.05	<5.5	<0.001	0.0015	
163. Nickel		2.3	8.8	6.2	0.037	0.057	
165. Silver		<0.9	<0.9	<18	0.018	0.0092	
167. Vanadium		<2.0	2.2	<2.6	<0.020	0.150	
168. Zinc		4.4	4,170	6810	0.071	9.50	
INORGANICS							
169. Total Cyanide		<0.5	0.9	<0.5	<0.010	<0.01	
170. Fluoride		<5.0	31	15	0.950	14.0	
171. Sulfide		NA	830	16,000	17.0	<1.0	
PCBs							
206. Arochlor 1260		NA	NA	33,500	NA	NA	

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-9 (Continued)

SAMPLE SET #3 (Continued)

<u>DESIGN AND OPERATING PARAMETERS</u>	<u>DESIGN</u>	<u>OPERATING VALUE</u> →
Afterburner Temperature (°F)*	*	2400
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)*	*	PCB Blend Feed Rate: 36.5 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)*		7.2
Carbon Monoxide Concentration (ppm volume)*		0

*This information has been claimed as RCRA Confidential Business Information.

Table 4-10

TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM[#]

SAMPLE SET #4

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste	
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan- Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)	
VOLATILES						
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002	
7. Carbon tetrachloride	3,900	<8	<2,000	1.90	<0.002	
9. Chlorobenzene	<2,000	<8	<2,000	<0.4	<0.002	
14. Chloroform	5,300	<8	<2,000	<0.4	<0.002	
21. Dichlorodifluoromethane	<2,000	<8	<2,000	<0.4	0.014	
22. 1,1-Dichloroethane	<2,000	<8	<2,000	<0.4	<0.002	
23. 1,2-Dichloroethane	122,000	<8	<2,000	<0.4	<0.002	
34. Methyl ethyl ketone	<10,000	940	<2,000	<0.4	<0.002	
38. Methylene chloride	<10,000	910	<10,000	3.5	<0.01	
42. Tetrachloroethene	7,200	490	<10,000	<2.0	<0.01	
43. Toluene	<2,000	2,300	<2,000	<0.4	<0.002	
45. 1,1,1-Trichloroethane	44,000	130	41,000	3.7	0.0046	
47. Trichloroethene	2,300	360	<2,000	2.3	<0.002	
215-217. Xylene (total)	<2,000	3,400	3,600	<0.4	<0.002	
222. Acetone	<10,000	1,200	36,000	4.4	<0.002	
226. Ethyl benzene	<2,000	2,200	<10,000	<2.0	<0.01	
229. Methyl isobutyl ketone	<10,000	1,100	16,000	4.1	<0.002	
			<10,000	<2.0	<0.01	
SEMI-VOLATILES						
51. Acenaphthalene	<10	150	120	<0.002	<0.002	
52. Acenaphthene	<10	<20	480	<0.002	<0.002	
56. Aniline	<25	<50	<250	1.22	<0.005	
57. Anthracene	<10	110	400	<0.002	<0.002	
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002	
68. Bis(2-chloroethyl) ether	310	<20	<100	<0.002	<0.002	
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002	

[#] Only one sample of this waste type was taken. The results are repeated in each sample set

Table 4-10 (Continued)

SAMPLE SET #4 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste	
	KO19 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan- Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)	
<u>SEMIVOLATILES (Continued)</u>						
80. Chrysene	SNA	28				
81. ortho-Cresol	<10	<20	<100	<0.002	<0.002	
87. o-Dichlorobenzene	<10	250	<100	0.020	<0.002	
88. p-Dichlorobenzene	84	32	1,060	2.55	<0.002	
90. 2,4-Dichlorophenol	<25	<50	460	0.260	<0.002	
91. 2,6-Dichlorophenol	<25	<50	<250	0.420	<0.005	
98. Di-n-butyl phthalate	<10	31	500	0.430	<0.005	
104. Di-n-octyl phthalate	<10	<20	120	0.012	0.0042	
108. Fluoranthene	<10	120	430	<0.002	<0.002	
109. Fluorene	21	53	300	<0.002	<0.002	
110. Hexachlorobenzene	61	<100	340	<0.002	<0.002	
111. Hexachlorobutadiene	<50	210	<500	0.022	<0.010	
113. Hexachloroethane	94	<100	<500	0.079	<0.010	
121. Naphthalene	360	<20	<500	0.018	<0.010	
122. 1,4-Naphthoquinone	<10	<20	400	0.133	<0.002	
126. Nitrobenzene	<25	<20	<100	0.078	<0.002	
136. Pentachlorobenzene	64	3,400	8,200	0.027	<0.002	
141. Phenanthrene	19	<100	1,000	0.020	<0.005	
142. Phenol	<10	240	950	<0.002	<0.010	
145. Pyrene	<10	78	1,000	4.56	<0.002	
148. 1,2,4,5-Tetrachlorobenzene	82	200	260	<0.002	<0.002	
150. 1,2,4-Trichlorobenzene	74	<50	1,400	0.008	<0.002	
152. 2,4,6-Trichlorophenol	<50	<50	19,000	1.240	<0.005	
		<100	<500	0.037	<0.005	

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

Only one sample of this waste type was taken. The results are repeated in each sample set

Table 4-10 (Continued)

SAMPLE SET #4 (Continued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration			Treated Waste	
	KO19 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan- Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.4
155. Arsenic	<0.2	94	7.4	<0.020	0.029
156. Barium	<0.9	1.3	<19	1.670	0.55
157. Beryllium	<0.1	<0.1	NA	<0.001	<0.001
158. Cadmium	<0.3	<0.3	<33	<0.003	0.13
159. Chromium	1.8	40	23.7	<0.009	0.14
160. Copper	<1.0	165	107	0.027	1.13
161. Lead	2.4	27	<7.3	0.0064	0.600
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.0004
163. Nickel	2.2	8.8	6.2	0.037	0.065
165. Silver	<0.9	<0.9	<18	0.018	0.092
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.150
168. Zinc	9.4	4,170	6810	0.071	9.98
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	5.0	31	15	0.950	13.0
171. Sulfide	NA	830	16,000	17.0	<1.0
PCBs					
206. Aroclor 1260	NA	NA	33,500	NA	NA

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-10 (Continued)

SAMPLE SET #4 (Continued)

<u>DESIGN AND OPERATING PARAMETERS</u>	<u>DESIGN</u>	<u>OPERATING VALUE</u> ++
Afterburner Temperature (°F)+	*	2400
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)+	*	PCB Blend Feed Rate: 36.5 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)+		6.4
Carbon Monoxide Concentration (ppm volume)+		0

*This information has been claimed as RCRA Confidential Business Information.

Table 4-11 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #5

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste	
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan- Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)	
VOLATILES						
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002	
7. Carbon tetrachloride	4,000	<8	<2,000	1.90	<0.002	
9. Chlorobenzene	<2,000	<8	<2,000	<0.4	<0.002	
14. Chloroform	6,000	<8	<2,000	<0.4	<0.002	
21. Dichlorodifluoromethane	<2,000	<8	<2,000	<0.4	<0.002	
22. 1,1-Dichloroethane	<2,000	<8	<2,000	<0.4	<0.002	
23. 1,2-Dichloroethane	130,000	<8	<2,000	<0.4	<0.002	
34. Methyl ethyl ketone	<10,000	940	<2,000	<0.4	<0.002	
38. Methylene chloride	<10,000	910	<10,000	3.5	<0.002	
42. Tetrachloroethene	7,800	490	<10,000	<2.0	<0.01	
43. Toluene	<2,000	2,300	<2,000	<0.4	<0.01	
45. 1,1,1-Trichloroethane	45,000	130	41,000	3.7	<0.002	
47. Trichloroethene	2,500	360	<2,000	2.3	<0.002	
215-217. Xylene (total)	<2,000	3,400	3,600	<0.4	<0.002	
222. Acetone	<10,000	1,200	36,000	4.4	<0.002	
226. Ethyl benzene	<2,000	2,200	<10,000	<2.0	<0.002	
229. Methyl isobutyl ketone	<10,000	1,100	16,000	4.1	<0.01	
			<10,000	<2.0	<0.002	
SEMIVOLATILES						
51. Acenaphthalene	<10	150	120	<0.002	<0.002	
52. Acenaphthene	<10	<20	480	<0.002	<0.002	
56. Aniline	<25	<50	<250	1.22	<0.005	
57. Anthracene	<10	110	400	<0.002	<0.002	
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002	
68. Bis(2-chloroethyl) ether	340	<20	<100	<0.002	<0.002	
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002	

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-11 (Continued)

SAMPLE SET #5 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration			Treated Waste	
	KO19 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Hercaptan- Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
<u>SEMIVOLATILES (Continued)</u>					
80. Chrysene	SNA	28	<100	<0.002	<0.002
81. ortho-Cresol	<10	<20	<100	0.020	<0.002
87. o-Dichlorobenzene	<10	250	1,060	2.55	<0.002
88. p-Dichlorobenzene	90	32	460	0.260	<0.002
90. 2,4-Dichlorophenol	<25	<50	<250	0.420	<0.005
91. 2,6-Dichlorophenol	<25	<50	500	0.430	<0.005
98. Di-n-butyl phthalate	<10	31	120	0.012	0.0027
104. Di-n-octyl phthalate	<10	<20	430	<0.002	<0.002
108. Fluoranthene	<10	120	300	<0.002	<0.002
109. Fluorene	19	53	340	<0.002	<0.002
110. Hexachlorobenzene	87	<100	<500	0.022	<0.01
111. Hexachlorobutadiene	<50	210	<500	0.079	<0.01
113. Hexachloroethane	113	<100	<500	0.018	<0.01
121. Naphthalene	371	<20	400	0.133	<0.002
122. 1,4-Naphthoquinone	<10	<20	<100	0.078	<0.002
126. Nitrobenzene	<25	3,400	8,200	0.027	<0.005
136. Pentachlorobenzene	63	<100	1,000	0.020	<0.01
141. Phenanthrene	19	240	950	<0.002	<0.002
142. Phenol	<10	78	1,000	4.56	<0.002
145. Pyrene	<10	200	260	<0.002	<0.002
148. 1,2,4,5-Tetrachlorobenzene	73	<50	1,400	0.008	<0.005
150. 1,2,4-Trichlorobenzene	72	<50	19,000	1.240	<0.005
152. 2,4,6-Trichlorophenol	<50	<100	<500	0.037	<0.010

SNA A standard is not available; the compound was searched using an NDS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-11 (Continued)

SAMPLE SET #5 (Continued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration			Treated Waste	
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan- Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.35
155. Arsenic	<0.2	94	7.4	<0.020	0.027
156. Barium	<0.9	1.3	<19	1.670	0.600
157. Beryllium	<0.1	<0.1	NA	<0.001	0.002
158. Cadmium	0.36	<0.3	<33	<0.003	0.12
159. Chromium	3.2	40	23.7	<0.009	0.14
160. Copper	2.1	165	107	0.027	1.03
161. Lead	2.5	27	<7.3	0.0064	0.48
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.001
163. Nickel	4.8	8.8	6.2	0.037	0.067
165. Silver	<0.9	<0.9	<18	0.018	0.090
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.160
168. Zinc	4.7	4,170	6810	0.071	11.1
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	<5.0	31	15	0.950	12.0
171. Sulfide	NA	830	16,000	17.0	<1.0
PCBs					
206. Aroclor 1260	NA	NA	33,500	NA	NA
NA Not Analyzed.					

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-11 (Continued)

SAMPLE SET #5 (Continued)

<u>DESIGN AND OPERATING PARAMETERS</u>	<u>DESIGN</u>	<u>OPERATING VALUE</u> →
Afterburner Temperature (°F)*	*	2400
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)*	*	PCB Blend Feed Rate: 37.5 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)*		6.8
Carbon Monoxide Concentration (ppm volume)		NR

NR Not Recorded.

*This information has been claimed as RCRA Confidential Business Information.

Table 4-12 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #6

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste	
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan- Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)	
VOLATILES						
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002	
7. Carbon tetrachloride	4,100	<8	<2,000	1.90	<0.002	
9. Chlorobenzene	<2,000	<8	<2,000	<0.4	<0.002	
14. Chloroform	5,600	<8	<2,000	<0.4	<0.002	
21. Dichlorodifluoromethane	<2,000	<8	<2,000	<0.4	<0.002	
22. 1,1-Dichloroethane	<2,000	<8	<2,000	<0.4	<0.002	
23. 1,2-Dichloroethane	98,000	<8	<2,000	<0.4	<0.002	
34. Methyl ethyl ketone	<10,000	940	<10,000	3.5	<0.01	
38. Methylene chloride	<10,000	910	<10,000	<2.0	<0.01	
42. Tetrachloroethene	6,900	490	<2,000	<0.4	<0.002	
43. Toluene	<2,000	2,300	41,000	3.7	<0.002	
45. 1,1,1-Trichloroethane	44,000	130	<2,000	2.3	<0.002	
47. Trichloroethene	2,500	360	3,600	<0.4	<0.002	
215-217. Xylene (total)	<2,000	3,400	36,000	4.4	<0.002	
222. Acetone	<10,000	1,200	<10,000	<2.0	<0.01	
226. Ethyl benzene	<2,000	2,200	16,000	4.1	<0.002	
229. Methyl isobutyl ketone	<10,000	1,100	<10,000	<2.0	<0.01	
SEMI-VOLATILES						
51. Acenaphthalene	<10	150	120	<0.002	<0.002	
52. Acenaphthene	<10	<20	480	<0.002	<0.002	
56. Aniline	<25	<50	<250	1.22	<0.005	
57. Anthracene	<10	110	400	<0.002	<0.002	
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002	
68. Bis(2-chloroethyl) ether	330	<20	<100	<0.002	<0.002	
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002	

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-12 (Continued)

SAMPLE SET #6 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste	
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan- Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)	
SEMI-VOLATILES (Continued)						
80. Chrysene	SNA	28	<100	<0.002	<0.002	
81. ortho-Cresol	<10	<20	<100	0.020	<0.002	
87. o-Dichlorobenzene	<10	250	1,060	2.55	<0.002	
88. p-Dichlorobenzene	90	32	460	0.260	<0.002	
90. 2,4-Dichlorophenol	<25	<50	<250	0.420	<0.005	
91. 2,6-Dichlorophenol	<25	<50	500	0.430	<0.005	
98. Di-n-butyl phthalate	<10	31	120	0.012	0.0025	
104. Di-n-octyl phthalate	<10	<20	430	<0.002	<0.002	
108. Fluoranthene	<10	120	300	<0.002	<0.002	
109. Fluorene	22	53	340	<0.002	<0.01	
110. Hexachlorobenzene	66	<100	<500	0.022	<0.01	
111. Hexachlorobutadiene	<50	210	<500	0.079	<0.01	
113. Hexachloroethane	88	<100	<500	0.018	<0.01	
121. Naphthalene	390	<20	400	0.133	<0.002	
122. 1,4-Naphthoquinone	<10	<20	<100	0.078	<0.002	
126. Nitrobenzene	<25	3,400	8,200	0.027	<0.005	
136. Pentachlorobenzene	65	<100	1,000	0.020	<0.01	
141. Phenanthrene	17	240	950	<0.002	<0.002	
142. Phenol	<10	78	1,000	4.56	<0.002	
145. Pyrene	<10	200	260	<0.002	<0.002	
148. 1,2,4,5-Tetrachlorobenzene	86	<50	1,400	0.008	<0.005	
150. 1,2,4-Trichlorobenzene	79	<50	19,000	1.24	<0.005	
152. 2,4,6-Trichlorophenol	<50	<100	<500	0.037	<0.01	

SNA A standard is not available; the compound was searched using an NIS Library data-base of 42,000 compounds. The compound was not detected.

Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-12 (Continued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration				Treated Waste	
	KO19 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan- Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)	
METALS						
154. Antimony	<6.0	24	<41	<0.060	0.32	
155. Arsenic	<0.2	94	7.4	<0.020	0.033	
156. Barium	<0.9	1.3	<19	1.670	0.57	
157. Beryllium	<0.1	<0.1	NA	<0.001	<0.001	
158. Cadmium	0.62	<0.3	<33	<0.003	0.11	
159. Chromium	5.3	40	23.7	<0.009	0.13	
160. Copper	3.6	165	107	0.027	0.87	
161. Lead	3.5	27	<7.3	0.0064	0.4	
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.001	
163. Nickel	6.0	8.8	6.2	0.037	0.061	
165. Silver	<0.9	<0.9	<18	0.018	0.092	
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.16	
168. Zinc	8.4	4,170	6810	0.071	10.4	
INORGANICS						
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01	
170. Fluoride	<5.0	31	15	0.950	12.0	
171. Sulfide	NA	830	16,000	17.0	<1.0	
PCBs						
206. Aroclor 1260	NA	NA	33,500	NA	NA	
NA Not Analyzed.						

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-12 (Continued)

SAMPLE SET #6 (Continued)

<u>DESIGN AND OPERATING PARAMETERS</u>	<u>DESIGN</u>	<u>OPERATING VALUE++</u>
Afterburner Temperature (°F)*	*	2350
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)*	*	PCB Blend Feed Rate: 37.5 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)*		7.0
Carbon Monoxide Concentration (ppm volume)		NR

NR Not Recorded.

*This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

Table 4-13 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K048 AND K051
PLANT 1 - STABILIZATION OF INCINERATOR ASH

Detected BDAT List Metal Constituents	Untreated Waste TCLP Extracts of K048 and K051 Incinerator Ash	Treated Waste											
		TCLP Extracts of Stabilized Fluidized Bed Incinerator Ash						Klin Dust Binder					
		Cement Binder			Lime and Fly Ash Binder			Run 1			Run 2		
		Run 1 mg/L (ppm)	Run 2 mg/L (ppm)	Run 3 mg/L (ppm)	Run 1 mg/L (ppm)	Run 2 mg/L (ppm)	Run 3 mg/L (ppm)	Run 1 mg/L (ppm)	Run 2 mg/L (ppm)	Run 3 mg/L (ppm)	Run 1 mg/L (ppm)	Run 2 mg/L (ppm)	Run 3 mg/L (ppm)
154. Antimony	0.06-0.09	<0.163	<0.163	<0.163	<0.163	0.178	<0.163	<0.163	<0.163	<0.163	<0.163	<0.163	<0.163
155. Arsenic	0.008-0.025	<0.004	<0.004	<0.004	0.005	0.005	0.005	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
156. Barium	0.17-0.25	0.277	0.28	0.278	0.203	0.2	0.204	0.558	0.524	0.599	0.558	0.524	0.599
157. Beryllium	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
158. Cadmium	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
159. Chromium (total)	2.1-2.6	2.11	2.12	2.16	1.78	1.92	1.87	1.13	1.21	1.08	1.13	1.21	1.08
221. Chromium (hexavalent)	NA	0.415	0.326	2.47	0.38	0.395	2.13	0.331	0.259	0.071	0.331	0.259	0.071
160. Copper	0.02	<0.003	<0.003	0.015	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
161. Lead	<0.05	<0.006	<0.006	0.011	0.02	0.009	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
162. Mercury	0.0002-0.0003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
163. Nickel	0.02-0.03	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018
164. Selenium	0.033-0.12	0.025	0.022	0.024	0.044	0.043	0.04	0.013	0.016	0.017	0.013	0.016	0.017
165. Silver	<0.009	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
166. Thallium	NA	<0.001	0.009	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
167. Vanadium	2.5-3.6	1.4	1.21	1.29	1.53	1.64	1.56	0.148	0.149	0.156	0.148	0.149	0.156
168. Zinc	0.055-0.11	0.058	0.047	0.086	0.048	0.042	0.031	0.02	0.022	0.052	0.02	0.022	0.052

NA = Not analyzed.

Table 4-13 (Continued)

Design and Operating Parameters	Stabilization Process									
	Cement			Kiln Dust			Lime and Fly Ash			
	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3	Run 3
Binder to Ash Ratio	0.2	0.2	0.2	0.2	0.2	0.2	NP	NP	NP	NP
Lime to Ash Ratio	NP	NP	NP	NP	NP	NP	0.2	0.2	0.2	0.2
Fly Ash to Ash Ratio	NP	NP	NP	NP	NP	NP	0.2	0.2	0.2	0.2
Water to Ash Ratio	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Ambient Temperature (°C)	23	23	23	19	19.5	20	19	19	19	19
Mixture pH	11.6	11.5	11.5	12.1	12.1	12.1	12.0	12.1	12.1	12.1
Cure Time (Days)	28	28	28	28	28	28	28	28	28	28
Unconfined Compressive Strength (lb/in ²)	943.5	921.6	1270	222.8	267.7	241.0	565.8	512.6	578.8	578.8

NP = Not applicable.

Table 4-14 EPA-Designated Toxicity Test Applied to
Vitrified Slags Containing Arsenic

Arsenic in slag (%)	Analysis of leach solution for arsenic from EP-toxicity test (mg/l)
0.3	0.007
0.54	0.016
0.77	0.047
2.1	0.448
3.3	0.421
5.2	0.902
9.0	0.337
9.1	0.415
12.4	0.115
13.7	0.308
16.4	0.377
19.4	0.802
20.7	0.846
23.5	1.791

EPA-specified concentration of arsenic for designation as a characteristic toxic material is 5 mg/l.

Source: Twidwell and Mehta 1985.

5. IDENTIFICATION OF BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT)

This section presents the Agency's rationale for determining best demonstrated available technology (BDAT) for K021 nonwastewaters and wastewaters.

To determine BDAT, the Agency examines all available performance data on technologies that are identified as demonstrated on the waste of concern or similar wastes to determine (using statistical techniques) whether one or more of the technologies performs significantly better than the others. All performance data used for determination of best technology must first be adjusted for accuracy, as discussed in EPA's publication Methodology for Developing BDAT Treatment Standards. (An accuracy adjustment accounts for the ability of an analytical technique to recover a particular constituent from the waste in a particular test. The recovery of a constituent is usually determined by spiking a sample with a known amount of the target constituent and then comparing the spiked sample amounts with results from unspiked samples.) BDAT must be specifically defined for all streams associated with the management of the listed waste or wastes; this pertains to the original waste as well as any residual waste streams created by the treatment process. Additionally, the ANOVA test is available to compare data from two or more demonstrated technologies and determine which offers the best treatment. The ANOVA test is described fully in the methodology background document (USEPA 1989a).

The technology that performs best, based on ANOVA tests, on a particular waste or waste treatability group is then evaluated to determine whether it is "available." To be available, the technology must (1) be commercially available to any generator and (2) provide "substantial" treatment of the waste, as determined through evaluation of accuracy-adjusted data. In determining whether treatment is substantial, EPA may consider data on the performance of a waste similar to the waste

in question provided that the similar waste is at least as difficult to treat. If the best technology is found to be not available, then the next best technology is evaluated, and so on.

5.1 BDAT for Organics

The determination of substantial treatment of organics involves comparing constituent concentrations in the original waste to the respective concentrations in all residual streams from treatment. No performance data are available for organics in the K021 waste as generated, but because of its similarity to K019 the Agency believes the "best" technology chosen for K019, incineration, would be applicable to K021. Incineration of K021 waste as generated (a nonwastewater) will result in two different treatment residues, scrubber water (wastewater) and incinerator ash (nonwastewater). These residues should be devoid of organic constituents; that is, the organic constituents will be present in amounts below than the detection limit.

EPA has determined in Section 3 that incineration is demonstrated on wastes similar to K021. Also, EPA believes that incineration provides substantial treatment for organics because the performance data for K019 show that untreated concentrations of constituents with higher boiling points than those of constituents proposed for regulation in K021 can be reduced to nondetectable levels in both the residual nonwastewater ash and the residual wastewater stream (the scrubber water). Thus, incineration is selected as "best" for organic constituents in K021 wastes.

As "best," "demonstrated," and "available," incineration is therefore BDAT for organics in K021 wastes.

5.2 BDAT for Metals

As discussed in Section 3, there are no demonstrated technologies for antimony treatment in K021 wastewaters. The Agency is, therefore, not

choosing a BDAT for metals treatment in K021 wastewaters. The method of choosing regulatory levels for antimony in K021 wastewaters without a demonstrated technology is explained in Section 7.

EPA has determined in Section 3 that vitrification is an applicable and demonstrated technology for antimony in K021 nonwastewater residuals. Also, EPA believes that vitrification for antimony provides substantial treatment because antimony levels are reduced to the EP-Toxicity level for arsenic. Additionally, vitrification yields residues with minimal hazardous properties. Therefore, EPA believes that vitrification is BDAT for antimony in nonwastewater residuals of K021. EPA also is choosing a numerical level for antimony in nonwastewaters based on stabilization performance data from K048-K052. This method of choosing a numerical standard for antimony without a demonstrated technology is outlined in Section 7.

6. SELECTION OF REGULATED CONSTITUENTS

This section presents the methodology and rationale for the selection of regulated constituents for the treatment of K021.

Generally, constituents selected for regulation must satisfy the following criteria:

1. They must be on the BDAT list of regulated constituents. (Presence on the BDAT list implies the existence of approved techniques for analyzing the constituent in treated waste matrices.)
2. They must be present in, or be suspected of being present in, the untreated waste. For example, in some cases, analytical difficulties (such as masking) may prevent a constituent from being identified in the untreated waste, but its identification in a treatment residual may lead the Agency to conclude that it is present in the untreated waste.
3. Where performance data are transferred, the selected constituents must be easier to treat than the waste constituent(s) from which performance data are transferred. Factors for assessing ease of treatment vary according to the technology of concern. For instance, for incineration the factors include bond dissociation energy, thermal conductivity, and boiling point.

From the group of constituents that are eligible to be regulated (i.e., all constituents on the BDAT List), EPA may select a subset of constituents as representative of the broader group. For example, out of a group of constituents that react similarly to treatment, the Agency might name only those that are the most difficult to treat as regulated constituents for the purpose of setting a standard.

6.1 Identification of BDAT List Constituents

As discussed in Sections 2 and 4, the Agency has no performance data from treatment of organics in K021 waste by incineration. Compositional

data for this waste were obtained from the RCRA Listing Background Document. Performance data for organics are available for K019, which the Agency believes is similar to K021 and therefore represents a source of transfer. The Agency is using these data as the best source of data for transfer. These data, along with information on the K021 waste-generating process, have been used to determine which BDAT list constituents are or may be present in the waste and thus which ones are potential candidates for regulation. Both K021 and K019 contain carbon tetrachloride and chloroform, the primary constituents of concern in K021. Table 6-1 (at the end of this section) indicates, for the untreated waste, three constituents that the Agency believes are likely to be present in K021, based on listing information. These three constituents (carbon tetrachloride, chloroform, and antimony) were considered as candidates for regulation.

6.2 Constituent Selection

The Agency is proposing to regulate the two organic BDAT list constituents believed to be present in K021--carbon tetrachloride and chloroform.

The Agency is also proposing to regulate antimony, the only BDAT list metal believed to be present.

Table 6-1 Potential Candidates for Regulation in K021 Waste

Constituent

Volatile organics

Carbon tetrachloride^a
Chloroform^a

Metals

Antimony^a

^a These constituents are selected for regulation.

7. DEVELOPMENT OF BDAT TREATMENT STANDARDS

The Agency bases numerical treatment standards for regulated constituents on the performance of well-designed and well-operated BDAT treatment systems. These standards must account for analytical limitations in available performance data and must be adjusted for variabilities related to treatment, sampling, and analytical techniques and procedures.

Concentration-based BDAT standards are determined for each constituent by multiplying the arithmetic mean of accuracy-adjusted constituent concentrations detected in the treated waste by a "variability factor" specific to each constituent. Accuracy adjustment of performance data is discussed later in this section. EPA's publication Methodology for Developing BDAT Treatment Standards details both accuracy adjustment and the determination and use of variability factors.

Where EPA has identified BDAT for a particular waste, but because of data limitations or for some other compelling reason cannot define specific treatment standards for that waste, the Agency can require the use of that treatment process as a technology standard.

In the case of K021 waste, the Agency is setting treatment standards for the volatile organic and metal constituents shown in Tables 7-1 and 7-2 at the end of this section. The organic treatment standards are based on performance data from the incineration of K019 waste (see Tables 4-1 through 4-12). The wastewater metal standards are also based on incineration of K019. For nonwastewater metal residuals, standards are based on either slag vitrification of arsenic or stabilization of K048-K052 ash (see Tables 4-13 and 4-14).

As discussed in Sections 2 and 3, there are no demonstrated technologies or characterization data for antimony in K021 wastewaters or nonwastewaters. Antimony was present, however, in untreated K019 and K048-K052

wastes and in the scrubber water residuals from the treatment of K019, and the ash residuals of K048-K052. Because the Agency does not know what concentration of antimony is normally found in untreated K021 waste, it assumes that there is not more antimony in K021 untreated waste than there was in K019 or K048-K052 untreated waste. (The concentration of antimony in the untreated K019 was 24 mg/l and in the untreated K048-K052 waste was 9 mg/l.) Based on this assumption, there should be no more antimony in either the scrubber water or incinerator ash from the treatment of K021 waste than is found in scrubber water and incinerator ash from the treatments of K019 and K048-K052 respectively. (The treated values for antimony from incineration of K019 are 0.38 mg/l for scrubber water and <0.06 mg/l TCLP for incinerator ash. For K048-K052 incinerator ash, antimony was found at 0.06 to 0.09 mg/l TCLP.) Therefore, the Agency is setting treatment standards for antimony in K021 scrubber water based on the performance data from incineration of K019 waste (see Tables 4-1 through 4-12); for antimony in K021 incinerator ash, the Agency is setting standards based on the stabilization of K048-K052 (see Table 4-13). If a facility should have to treat K021 with antimony levels significantly higher than the levels found in K019 or in K048-K052, the sources of antimony transfer for K021, this facility may petition for a variance. Additionally, the Agency is setting treatment standards for antimony in the nonwastewater residuals of K021 from the vitrification of arsenic because available literature (Tooley 1984) has revealed that antimony is often used as a component in glass (i.e., vitrified).

The accuracy-adjusted concentration for a constituent in a matrix is the analytical result multiplied by the correction factor (the reciprocal of the recovery fraction).^{*} For example, if Compound A is measured

^{*}The recovery fraction is the ratio of (1) the measured amount of constituent (or surrogate) in a spiked aliquot minus the measured amount of constituent (or surrogate) in the original unspiked aliquot to (2) the known amount of constituent (or surrogate) added to spike the original aliquot. (Refer to the Generic Quality Assurance Project Plan for Land Disposal Restrictions Program ("BDAT").)

at 2.55 mg/l and the recovery is 85 percent, the accuracy-adjusted concentration is 3.00 mg/l:

$$\begin{array}{ccccccc} 2.55 & \text{mg/l} & & \times & & 1/0.85 & = & 3.00 & \text{mg/l} \\ (\text{analytical result}) & & & & & (\text{correction factor}) & & & (\text{accuracy-adjusted concentration}) \end{array}$$

After treatment performance data are corrected for accuracy, the arithmetic average of the corrected data is calculated for each constituent. In cases where the constituent is not detected above its detection limit, the detection limit is used to calculate the average constituent concentration in the treated waste. The next step in calculating treatment standards is to determine the variability factor for each regulated constituent. EPA is using a variability factor of 2.8 for all of the volatile organic constituent treatment standard calculations for K021 nonwastewaters because treatment performance values for each constituent transferred from K019 was below the detection limit in the K019 incinerator ash. All of the variability factors for constituents in K021 wastewaters are also 2.8 because the treatment performance for each constituent transferred from K019 was below the detection limit.

The variability factor for antimony in nonwastewaters is 2.8 because treatment performance from incineration of K048-K052 is below the detection limit. Also, treatment performance for vitrification is from one data set making the variability factor 2.8. For antimony treatment standards in wastewaters, the variability factor has been calculated to be 1.26.

BDAT treatment standards are calculated for each constituent by multiplying the arithmetic mean of accuracy-adjusted concentrations by the variability factor of each constituent. Table 7-3 summarizes all treatment standards being established for K021 waste. Note that concentrations are expressed in terms of mg/kg and mg/l for nonwastewaters and wastewaters, respectively.

Table 7-1 Calculations of Nonwastewater Treatment Standards for Constituents
Proposed for Regulation in K021 Waste

Constituent	Treated average nonwastewater concentration (mg/kg)	Analytical recovery (%)	Correction factor (reciprocal of analytical recovery)	Corrected analytical values	Variability factor	Treatment standard (mg/kg)
<u>Volatile organics</u>						
Carbon tetrachloride	< 2.0	91	1.1	2.2	2.8	6.2
Chloroform	< 2.0	91	1.1	2.2	2.8	6.2
<u>Metals</u>						
	TCLP (mg/l)					TCLP (mg/l)
Antimony	<0.060	74 ^a	1.35	0.08	2.8	0.23
	2.0	100	1.0	2.0	2.8	or 5.6 (EP Tox for arsenic)

^a No analytical recoveries are available for antimony from K019. Therefore, the analytical recovery for antimony is taken from K048-K052 metals data. K048-K052 are also organic nonwastewaters.

Table 7-2 Calculations of Wastewater Treatment Standards for Constituents
Proposed for Regulation in K021 Waste

Constituent	Treated average wastewater concentration (mg/l)	Analytical recovery (%)	Correction factor (reciprocal of analytical recovery)	Corrected analytical values	Variability factor	Treatment standard (mg/l)
<u>Volatile organics</u>						
Carbon tetrachloride	<0.002	78	1.3	0.003	2.8	0.008
Chloroform	<0.002	78	1.3	0.003	2.8	0.008
<u>Metals</u>						
Antimony	0.38	80.7 ^a	1.24	0.47	1.26	0.6 ^b

^a No analytical recovery information is available for metals in K019; therefore, the average of the analytical recoveries for metals in K048-K052 were used. K048-K052 are also organic nonwastewaters.

^b Data from EPA's Office of Water has also been analyzed to set a proposed standard for antimony in wastewaters of 1.9 mg/l. This process is analyzed in detail in Sections III.A.2.a.(3) and III.A.1.h.(b) of the preamble.

Table 7-3 Treatment Standards for K021 Waste

Constituent	Maximum for any single grab sample		
	Nonwastewaters		Wastewaters
	Total concentration (mg/kg)	TCLP leachate concentration (mg/l)	Total concentration (mg/l)
<u>Volatile organics</u>			
Carbon tetrachloride	6.2	NA	0.008
Chloroform	6.2	NA	0.008
<u>Metals</u>			
Antimony	NA	0.23 or 5.6 (EP Tox for arsenic)	0.60 ^a

NA = Not applicable.

^a Data from EPA's Office of Water has also been analyzed to set a proposed standard for antimony in wastewaters of 1.9 mg/l. This process is analyzed in detail in Sections III.A.2.a.(3) and III.A.1.h.(b) of the preamble.

8. REFERENCES

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